

1160 W. Orange Grove Ave., Arcadia, California, U.S.A.
© Copyright 1971

A FIELD-CAPTURED SCALE-DEFICIENT
MUTANT OF
ANTHOCARIS SARA

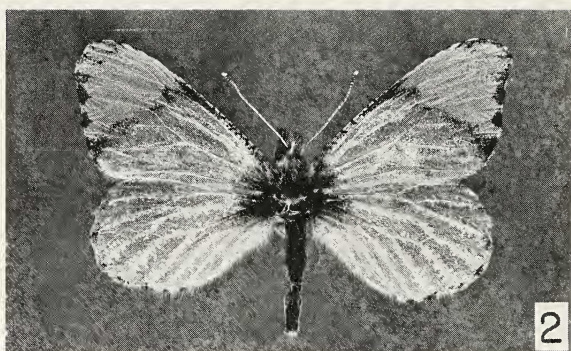
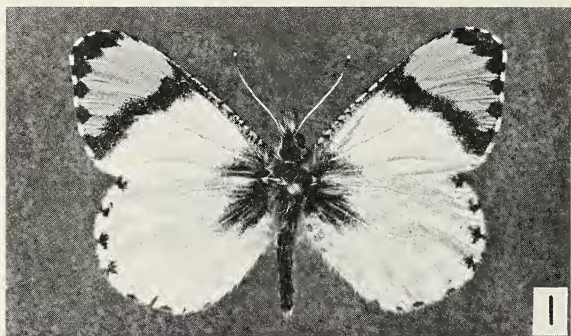
ERNST J. DORNFELD

Department of Zoology, Oregon State University
Corvallis, Oregon 97331

THE ORANGE-TIP *Anthocaris sara flora* Wright is an abundant butterfly in the McDonald Forest, a university arboretum just north of Corvallis, Oregon. A normal male specimen from this locality (April 23, 1959) is shown in figure 1. On March 31, 1968 I netted a highly aberrant male (figure 2) which displayed a weak flight and appeared at first impression to be a worn and unaccountably rubbed specimen. Closer inspection showed, on the contrary, that it was in fresh condition but strongly deficient in scaling.

The aberrancy of this specimen (figure 2) is precisely symmetrical. The most striking feature is the extensive loss of scales, these being largely limited, especially on the hind wings, to the veins (figure 3). On the ventral surface this restriction is extremely sharp. The marginal fringe scales are scanty and on the hind wings present only in small patches. The characteristic normal green splotches of the HW underside (intervenous mixtures of black, white, and yellow scales) are completely lacking. The costal margins of the forewings are curled upward, and the extreme lateral wing margins curve downward. The wings in their entirety are noticeably narrowed.

On microscopic examination the scales of the aberrant specimen are seen to be defective (figure 5). For the most part they are narrowed and give the impression of being elongated. To varying degrees their distal pronged margins are ill-defined, reduced, or lacking. Some scales, particularly among those few remaining in the bare regions, are severely dwarfed and variously misshapen. In these areas the scale sockets are exposed and they, too, are conspicuously abnormal. It is apparent that wrinkling of the wing cuticula has occurred, giving rise to radiating ridges



- Fig. 1. Normal male of *Anthocaris sara flora* Wright. McDonald Forest, Benton Co., Oregon; April 23, 1959.
- Fig. 2. Scale-deficient mutant. McDonald Forest, Benton Co., Oregon; March 31, 1968.
- Fig. 3. Magnified portion of right hind wing of mutant. Note restriction of scales to region of veins.

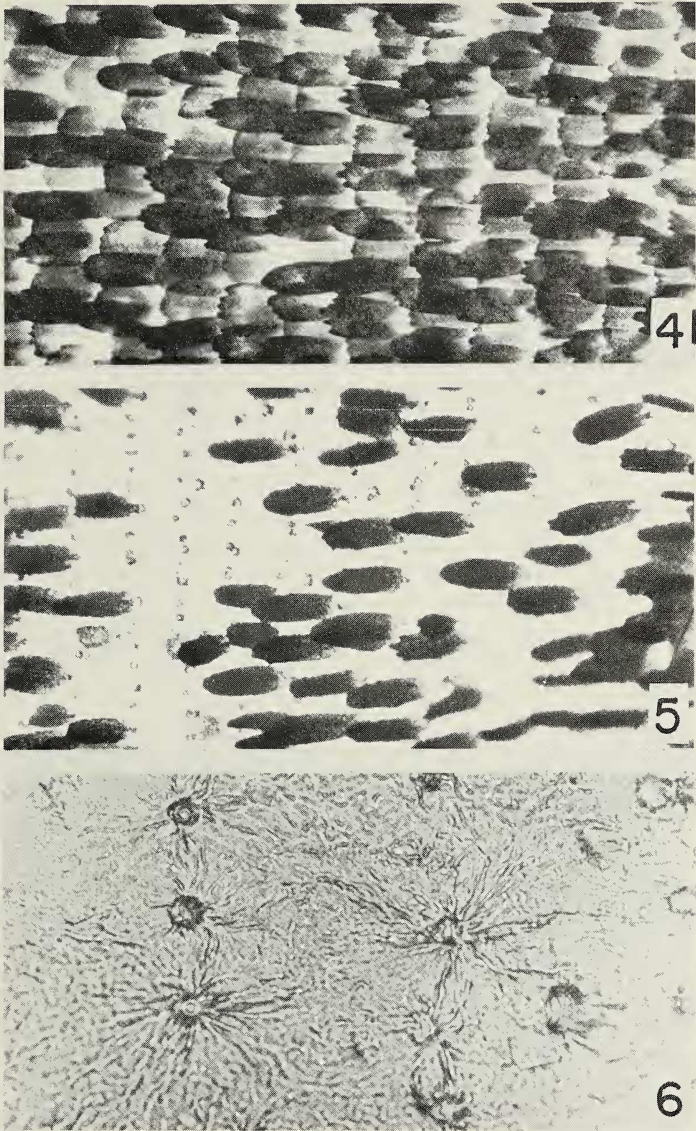


Fig. 4. Scale pattern of normal *Anthocaris* forewing, region of diagonal black crossbar.

Fig. 5. Scale pattern of scale-deficient mutant, same region. Note rows of scale-sockets in bare areas. Remaining scales are narrowed and variously deformed.

Fig. 6. High magnification of scale-deficient area. Note wrinkling of wing surface, with cuticular ridges radiating from deformed scale-sockets.

that emanate from the sockets (figure 6). Loose scales in these regions suggest that they have fallen from the defective sockets.

I have not succeeded in finding in the literature any description of a field-captured aberration of this type. There are, however, accounts of this aberrancy appearing under laboratory conditions in reared populations. A thorough study of such a case was published from the laboratory of Professor Alfred Kühn of the Max-Planck-Institute (Kühn & Berg, 1951; Kühn & Merkel née Berg, 1955). In his cultures of the moth *Ptychopoda seriata* an incompletely dominant mutant appeared with precisely the same aberrant features shown by the present specimen of *Anthocaris*. He termed this mutation *squamis deletis* (symbolized *Sqd*). Moreover, he was able to produce in the meal moth *Ephestia kühniella* exact phenocopies of this mutant condition by exposing the pupa during a limited sensitive period to heat shock ($45^{\circ}\text{C} = 112^{\circ}\text{F}$) for 45 minutes. A similar experimental observation had been made by Köhler & Feldotto (1937), working with *Vanessa urticae*. It would appear that the mutation involves gene action associated with cuticular development in the pupal stage. Very recently, working with *Pieris rapae*, Kolyer (1970) produced another instance of a heat-induced phenocopy of the *Sqd* mutant type (pupae exposed to $41.4\text{--}47.5^{\circ}\text{C}$ for 20 minutes). His figures 14 and 15 should be compared to figures 2 and 3 of this account.

Considering the symmetrical pattern of the *Anthocaris* aberration, its close resemblance to the *Sqd* mutation of *Ptychopoda*, and the extremely unnatural stimulus required to produce a phenocopy, this specimen in all likelihood represents a mutant individual. Its weak flight pattern (for whatever reason) has been noted, suggesting low chance of survival and a possible reason why this type of aberration does not seem to have been previously reported as a field capture.

LITERATURE CITED

- KÖHLER, W., and W. FELDOTTO, 1937. Morphologische und experimentelle Untersuchungen über Farbe, Form und Struktur der Schuppen von *Vanessa urticae* und ihre gegenseitigen Beziehungen. *Roux' Arch.* 136: 313-399.
- KÜHN, ALFRED, and ANNELIESE BERG, 1951. Eine neue Mutation mit wechselnder und zeitlich beschränkter Wirkung bei *Ptychopoda seriata*. *Z. Naturforschg.* 6b: 41-44.
- KÜHN, ALFRED, and ANNELIESE MERKEL, 1955. Über einige die Beschuppung des Schmetterlingsflügels beeinflussende Mutationen und Phänokopien. *Biol. Zentralbl.* 74: 113-145.
- KOLYER, JOHN M., 1970. Variations in the markings of *Pieris rapae* (Pieridae) induced during the pupal stage. *J. Lepid. Soc.* 24: 125-134.